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PROTECTIVE ORDER

**EXHIBIT C**

## EXHIBIT C

## INFRINGEMENT OF U.S. 8,913,898 BY FUJITSU

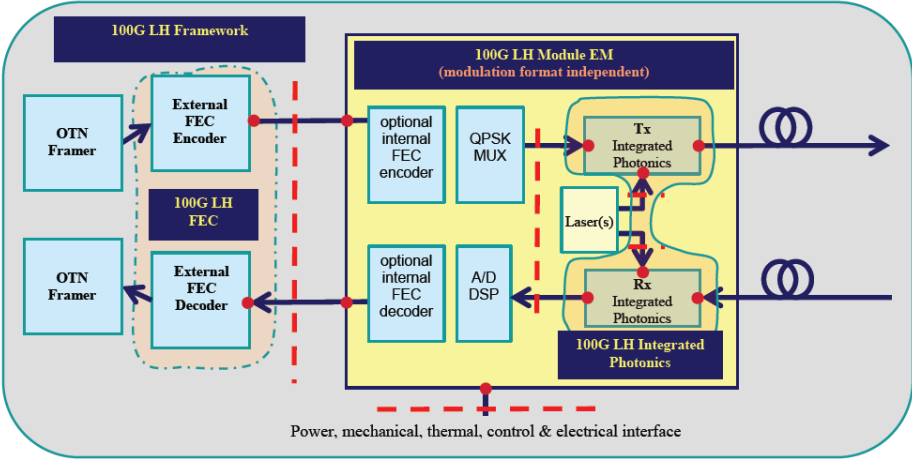
Fujitsu Network Communications (“Fujitsu”) infringed one or more claims of U.S. 8,913,898 by selling and offering for sale the Fujitsu 100G OIF 168pin Coherent Transceiver (FIM85200), 100G CFP DCO Transceiver (FIM38000/100; FIM38100/100), 100G/200G CFP2 ACO Transceiver (FIM38500; FIM38100), 100G CFP Transceiver (FIM37101; FIM37102; FIM37201; FIM37102), 100G CFP2 Transceiver (FIM37301; FIM37302; FIM37401; FIM37402), 100G QSFP28 Transceiver (FIM37700; FIM37800), 100G/400G LN Modulator (FTM7992HM; FTM7990HKA; FTM7977HQA), 100G/400G Integrated Coherent Receiver (FIM24901; FIM24721), HD62 OTN Switch Aggregator Unit, TM61 OTU4 OTN Transponder Demarcation Unit, and Flashwave 7420 WDM Platform products, as well as the compatible chassis in which they are installed, and other products operating in a substantially similar manner such as, for example, the Flashwave 9500 Platform product and all compatible components and chassis, and the 1Finity Platform product and all compatible components and chassis. (the “Accused Instrumentalities”).

Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
1	[pre] A transceiver card for a telecommunications box for transmitting data over a first optical fiber and receiving data over a second optical fiber, the transceiver card comprising:	<p>Fujitsu infringed Claim 1, and the claims discussed herein that directly or indirectly depend on Claim 1, by making, selling, using, offering for sale, and/or causing to be used the Accused Instrumentalities.</p> <p>To the extent that the preamble is considered to be a limitation, the Accused Instrumentalities comprise transceiver card for a telecommunications box for transmitting data over a first optical fiber and receiving data over a second optical fiber.</p> <p>For example:  the Fujitsu 1100G OIF 168pin Coherent Transceiver (FIM85200) is a transceiver card with a transmitting and receiving interface for DP-QPSK data. (100G OIF 168pin Coherent Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gtrx/index.html">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gtrx/index.html</a>);  the Fujitsu 100G CFP DCO Transceiver (FIM38000/100; FIM38100/100) is a transceiver card with a transmitting and receiving interface for DP-QPSK data. (100G CFP DCO Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp-dco/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp-dco/</a>);</p>

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Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
		<p>the Fujitsu 100G/200G CFP2 ACO Transceiver (FIM38500; FIM38100) is a transceiver card with a transmitting and receiving interface for DP-QPSK data. (100G/200G CFP2 ACO Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp2-aco/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp2-aco/</a>);</p> <p>the Fujitsu 100G CFP Transceiver (FIM37101; FIM37102; FIM37201; FIM37102) is a transceiver card with a transmitting and receiving interface for DP-QPSK data (100G CFP Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp/</a>);</p> <p>the Fujitsu 100G CFP2 Transceiver (FIM37301; FIM37302; FIM37401; FIM37402) is a transceiver card with a transmitting and receiving interface for DP-QPSK data (100G CFP2 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp2/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp2/</a>);</p> <p>the Fujitsu 100G QSFP28 Transceiver (FIM37700; FIM37800) is a transceiver card with a transmitting and receiving interface for DP-QPSK data (100G QSFP28 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100g-qsfp28/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100g-qsfp28/</a>);</p> <p>the Fujitsu 100G/400G LN Modulator (FTM7992HM; FTM7990HKA; FTM7977HQA) is a transceiver card with a transmitting and receiving interface for DP-QPSK data (100G Optical Devices Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g">http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g</a>);</p> <p>the Fujitsu 100G/400G Integrated Coherent Receiver (FIM24901; FIM24721) is a component of a transceiver with receiving interface for DP-QPSK data (100G QSFP28 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g">http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g</a>);</p> <p>the Fujitsu HD62 OTN Switch Aggregator Unit is a transceiver card with a transmitting and receiving interface for DP-QPSK data (Flashwave CDS Data Sheet);</p> <p>the Fujitsu TM61 OTU4 OTN Transponder Demarcation Unit is a transceiver card with a transmitting and receiving interface for DP-QPSK data (Flashwave CDS Data Sheet); and</p> <p>the Fujitsu Flashwave 7420 WDM Platform a transceiver card with a transmitting and receiving interface for DP-QPSK data (Flashwave 7420 Data Sheet)</p>

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Asserted Claim No.	Claim Element	Exemplary Evidence of Infringement
		<p>By way of example and without any limitation, the OIF 100G standard taught a transceiver module, as depicted below. See, e.g., OIF-FD-100G-DWDM-01.0 at 8-9 (“All the blocks illustrated are contained on a single printed circuit board. The large block on the right represents the 100G transceiver module – electro mechanicals. As discussed above this OIF project addresses physical aspects of this module and the electrical data and control interfaces to it.”).</p>  <p style="text-align: center;">Figure 7. Block diagram of a transceiver module</p> <p>By way of example and without any limitation, Fujitsu is a member of the OIF 100G standard. See, e.g., OIF-DPC-MRX-01.0-IA at 32.</p>

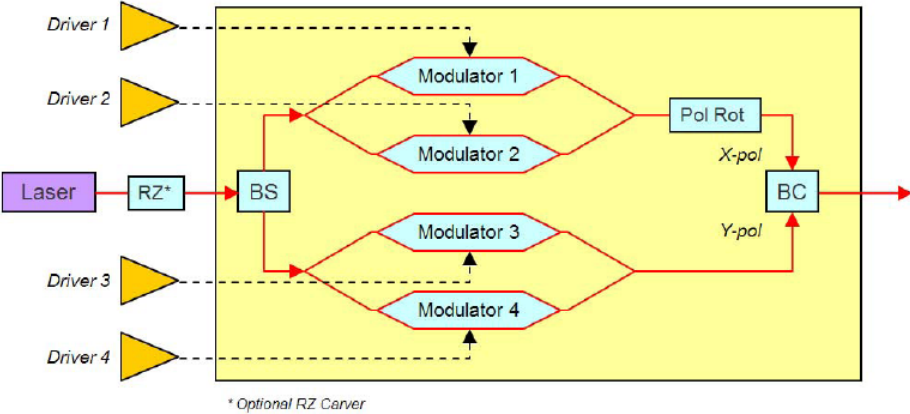
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Asserted Claim No.	Claim Element	Exemplary Evidence of Infringement																																																																																							
		<p><b>12 Appendix C: List of companies belonging to the OIF at approval date</b></p> <table> <tr><td>Acacia Communications</td><td>Fujikura</td><td>NeoPhotonics</td></tr> <tr><td>ADVA Optical Networking</td><td>Fujitsu</td><td>NTT Corporation</td></tr> <tr><td>Alcatel-Lucent</td><td>Furukawa Electric Japan</td><td>Oclaro</td></tr> <tr><td>Altera</td><td>Google</td><td>Orange</td></tr> <tr><td>AMCC</td><td>Hewlett Packard</td><td>PacketPhotonics</td></tr> <tr><td>Amphenol Corp.</td><td>Hitachi</td><td>PETRA</td></tr> <tr><td>Analog Devices</td><td>Huawei Technologies</td><td>Picomatrix</td></tr> <tr><td>Anritsu</td><td>IBM Corporation</td><td>PMC Sierra</td></tr> <tr><td>Applied Communication Sciences</td><td>Infinera</td><td>QLogic Corporation</td></tr> <tr><td>Avago Technologies Inc.</td><td>Inphi</td><td>Qorvo</td></tr> <tr><td>Broadcom</td><td>Intel</td><td>Ranovus</td></tr> <tr><td>Brocade</td><td>Ixia</td><td>Rockley Photonics</td></tr> <tr><td>BRPhotonics</td><td>JDSU</td><td>Samtec Inc.</td></tr> <tr><td>BTI Systems</td><td>Juniper Networks</td><td>Semtech</td></tr> <tr><td>China Telecom</td><td>Kaiaam</td><td>Spirent Communications</td></tr> <tr><td>Ciena Corporation</td><td>Kandou</td><td>Sumitomo Electric Industries</td></tr> <tr><td>Cisco Systems</td><td>KDDI R&amp;D Laboratories</td><td>Sumitomo Osaka Cement</td></tr> <tr><td>ClariPhy Communications</td><td>Keysight Technologies, Inc.</td><td>TE Connectivity</td></tr> <tr><td>Coriant R&amp;G GmbH</td><td>LeCroy</td><td>Tektronix</td></tr> <tr><td>CPqD</td><td>Luxtera</td><td>TELUS Communications, Inc.</td></tr> <tr><td>Deutsche Telekom</td><td>M/A-COM Technology Solutions</td><td>TeraXion</td></tr> <tr><td>Dove Networking Solutions</td><td>Mellanox Technologies</td><td>Texas Instruments</td></tr> <tr><td>EMC Corp</td><td>Microsemi Inc.</td><td>Time Warner Cable</td></tr> <tr><td>Emcore</td><td>Microsoft Corporation</td><td>US Conec</td></tr> <tr><td>Ericsson</td><td>Mitsubishi Electric Corporation</td><td>Verizon</td></tr> <tr><td>ETRI</td><td>Molex</td><td>Xilinx</td></tr> <tr><td>FCI USA LLC</td><td>MoSys, Inc.</td><td>Yamaichi Electronics Ltd.</td></tr> <tr><td>Fiberhome Technologies Group</td><td>MultiPhy Ltd</td><td>ZTE Corporation</td></tr> <tr><td>Finisar Corporation</td><td>NEC</td><td></td></tr> </table>	Acacia Communications	Fujikura	NeoPhotonics	ADVA Optical Networking	Fujitsu	NTT Corporation	Alcatel-Lucent	Furukawa Electric Japan	Oclaro	Altera	Google	Orange	AMCC	Hewlett Packard	PacketPhotonics	Amphenol Corp.	Hitachi	PETRA	Analog Devices	Huawei Technologies	Picomatrix	Anritsu	IBM Corporation	PMC Sierra	Applied Communication Sciences	Infinera	QLogic Corporation	Avago Technologies Inc.	Inphi	Qorvo	Broadcom	Intel	Ranovus	Brocade	Ixia	Rockley Photonics	BRPhotonics	JDSU	Samtec Inc.	BTI Systems	Juniper Networks	Semtech	China Telecom	Kaiaam	Spirent Communications	Ciena Corporation	Kandou	Sumitomo Electric Industries	Cisco Systems	KDDI R&D Laboratories	Sumitomo Osaka Cement	ClariPhy Communications	Keysight Technologies, Inc.	TE Connectivity	Coriant R&G GmbH	LeCroy	Tektronix	CPqD	Luxtera	TELUS Communications, Inc.	Deutsche Telekom	M/A-COM Technology Solutions	TeraXion	Dove Networking Solutions	Mellanox Technologies	Texas Instruments	EMC Corp	Microsemi Inc.	Time Warner Cable	Emcore	Microsoft Corporation	US Conec	Ericsson	Mitsubishi Electric Corporation	Verizon	ETRI	Molex	Xilinx	FCI USA LLC	MoSys, Inc.	Yamaichi Electronics Ltd.	Fiberhome Technologies Group	MultiPhy Ltd	ZTE Corporation	Finisar Corporation	NEC	
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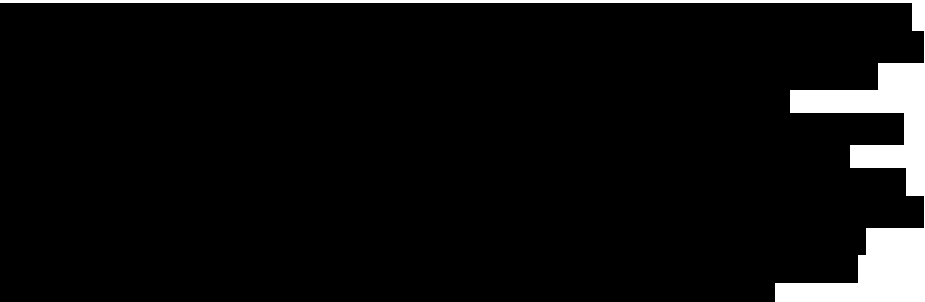
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Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
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	[a] a transmitter having a laser, a modulator, and a controller configured to receive input data and control the modulator to generate	<p>The Accused Instrumentalities include a transmitter having a laser, a modulator, and a controller configured to receive input data and control the modulator to generate a first optical signal as a function of the input data.</p> <p>By way of example and without any limitation, the OIF 100G standard taught a transmitter module which includes a laser, modulators that modulate phase of the light, drivers, including</p>

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Asserted Claim No.	Claim Element	Exemplary Evidence of Infringement
	a first optical signal as a function of the input data;	<p>other components that are not represented, as depicted below. See, e.g., OIF-FD-100G-DWDM-01.0 at 5-6.</p>  <p>Figure 4. Block diagram of a DP QPSK transmitter module</p> <p>By way of example and without any limitation, the OIF 100G standard taught that the “signal [framed incoming data] then passes to the transceiver module. Data is converted to drive signals to control the optical modulators. A transmit laser provides the light source for the modulators. On the receive side the incoming signal is mixed with a local oscillator, demodulated into components, detected, amplified, digitized, then passed into the DSP module.” OIF-FD-100G-DWDM-01.0 at 9.</p>

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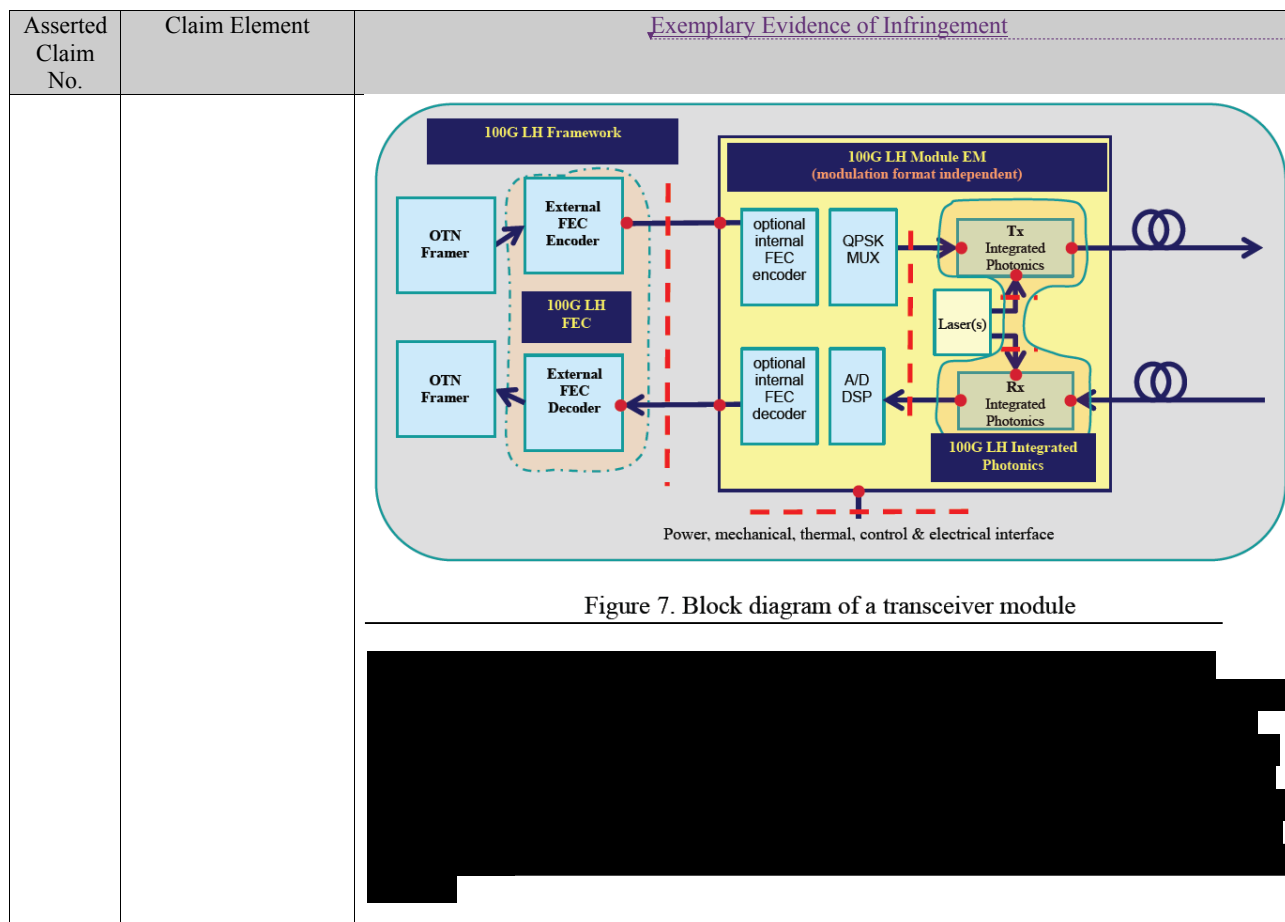
Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
		 
	[b] a fiber output optically connected to the transmitter and configured to optically connect the first optical fiber to the transceiver card;	<p>The Accused Instrumentalities include a a fiber output optically connected to the transmitter and configured to optically connect the first optical fiber to the transceiver card. By way of example and without any limitation, the Accused Instrumentalities include an optical fiber interface (100G OIF 168pin Coherent Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gtrx/index.html">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gtrx/index.html</a>); 100G/200G CFP2 ACO Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp2-aco/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp2-aco/</a>; 100G CFP Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp/</a>; 100G CFP2 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp2/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp2/</a>;</p>

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Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
		<p>100G QSFP28 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100g-qsfp28/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100g-qsfp28/</a>;  100G Optical Devices Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g">http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g</a>);  100G QSFP28 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g">http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g</a>;  Flashwave CDS Data Sheet;  Flashwave 7420 Data Sheet)</p> <p>By way of example and without any limitation, the OIF 100G standard taught a transceiver module in which the optical signal is transmitted by Tx through a fiber output, as depicted below. See, e.g., OIF-FD-100G-DWDM-01.0 at 9.</p>

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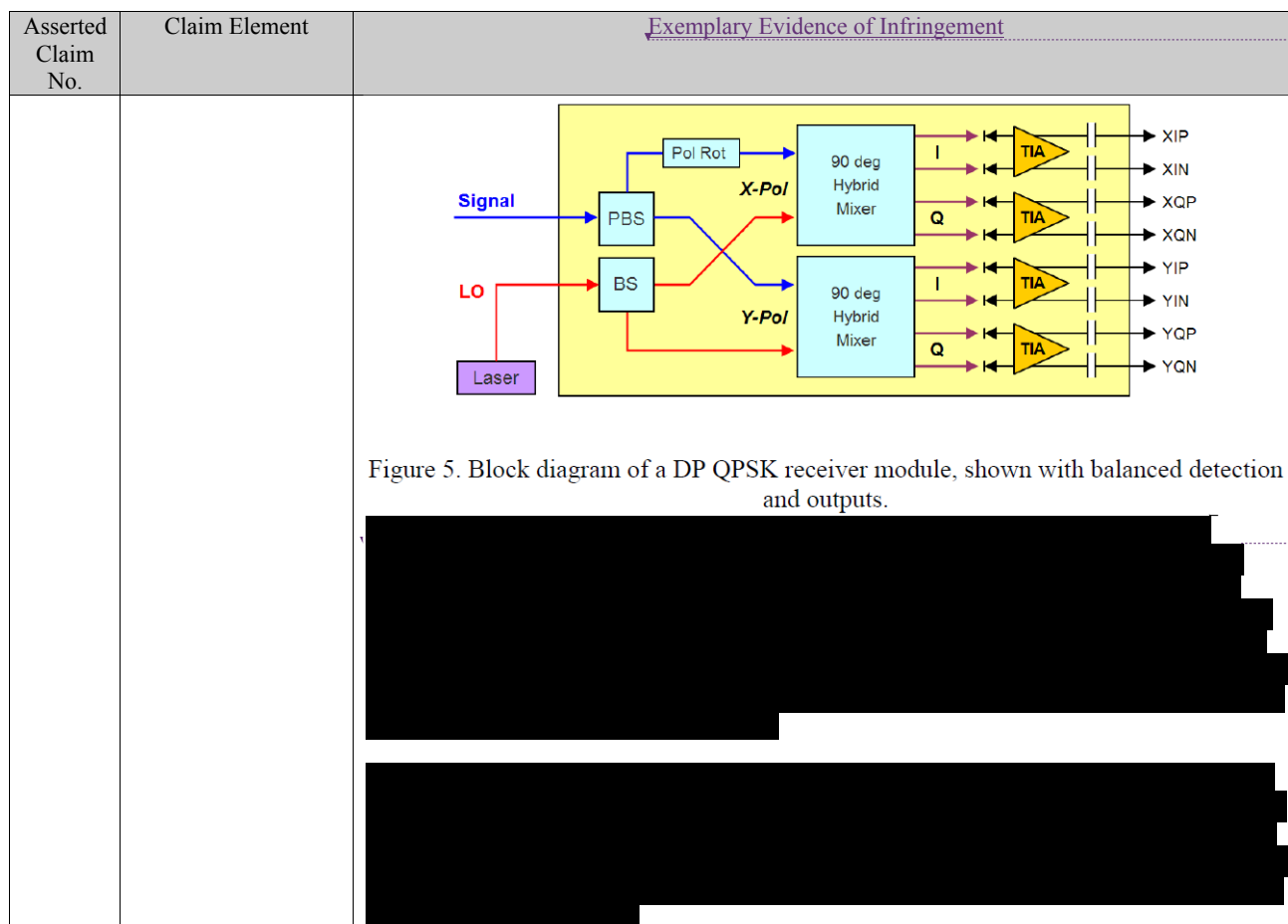
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Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
		

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Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
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	[c] a receiver configured to receive a second optical signal from the second optical fiber and to convert the second optical signal to output data;	<p>The Accused Instrumentalities include a receiver configured to receive a second optical signal from the second optical fiber and to convert the second optical signal to output data.</p> <p>By way of example and without any limitation, the OIF 100G standard taught a receiver module which receives a phase modulated signal through an optical fiber, as depicted below. See, e.g., OIF-FD-100G-DWDM-01.0 at 6.</p>

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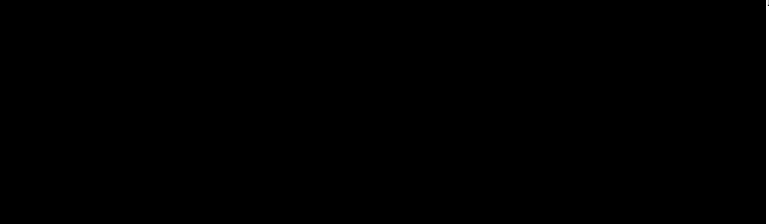


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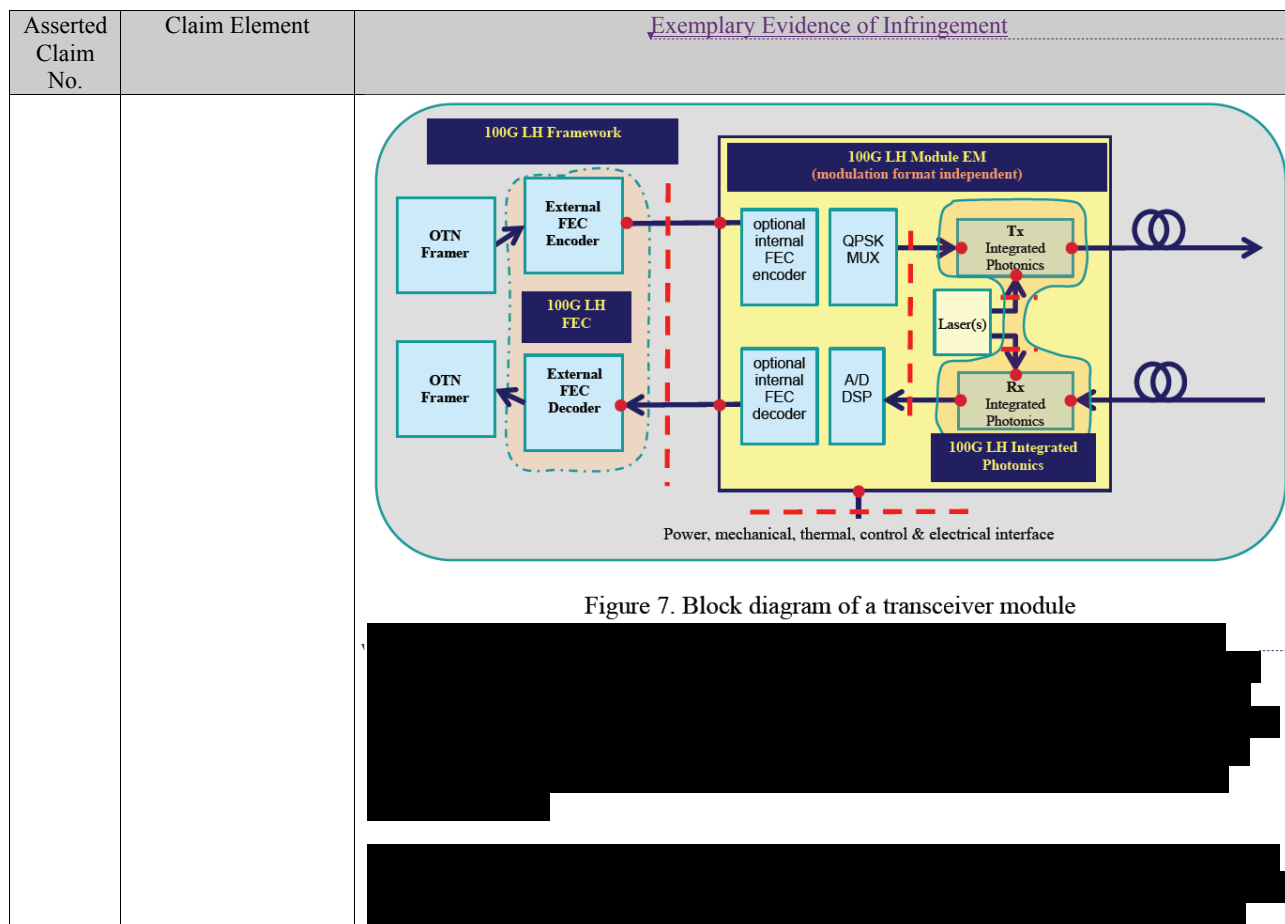
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Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
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Asserted Claim No.	Claim Element	Exemplary Evidence of Infringement
		
	[d] fiber input optically connected to the receiver and configured to optically connect the second optical fiber to the transceiver card; and	<p>The Accused Instrumentalities include a fiber input optically connected to the receiver and configured to optically connect the second optical fiber to the transceiver card. (100G OIF 168pin Coherent Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gtrx/index.html">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gtrx/index.html</a>); 100G/200G CFP2 ACO Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp2-aco/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp2-aco/</a>; 100G CFP Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp/</a>; 100G CFP2 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp2/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp2/</a>; 100G QSFP28 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100g-qsfp28/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100g-qsfp28/</a>; 100G Optical Devices Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g">http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g</a>; 100G QSFP28 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g">http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g</a>; Flashwave CDS Data Sheet; Flashwave 7420 Data Sheet)</p> <p>By way of example and without any limitation, the OIF 100G standard taught a transceiver module in which the optical signal is received by Rx through a fiber input, as depicted below. See, e.g., OIF-FD-100G-DWDM-01.0 at 9.</p>

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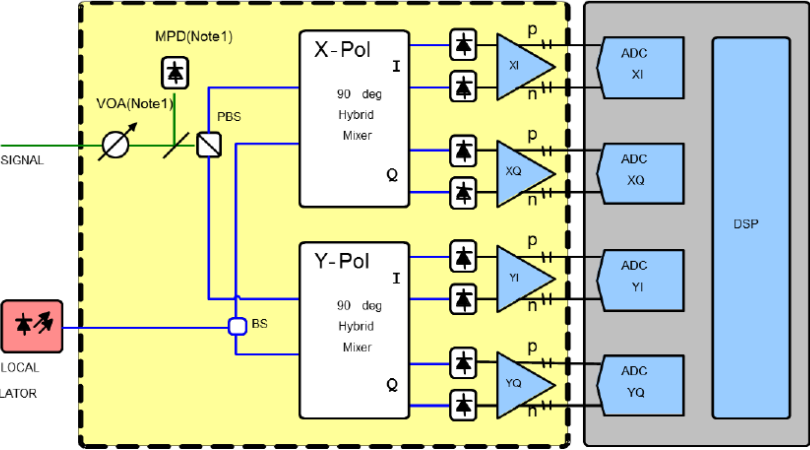


Asserted Claim No.	Claim Element	Exemplary Evidence of Infringement
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	[e] an energy level detector optically connected between the receiver and the fiber input to measure an energy level of the second optical signal, wherein the energy level detector includes a plurality of thresholds.	<p>The Accused Instrumentalities include an energy level detector optically connected between the receiver and the fiber input to measure an energy level of the second optical signal, wherein the energy level detector includes a plurality of thresholds.</p> <p>By way of example and without any limitation, the OIF 100G standard taught that:</p> <p>[a]s indicated in Figure 2-1, the coherent receiver requires the following basic functionality:</p> <ol style="list-style-type: none"> <li>1. Eight (8) photo-detectors, comprised of 4 sets of balanced detectors</li> <li>2. Four (4) linear amplifiers with differential ADC coupled outputs</li> <li>3. Two (2) ninety degree hybrid mixers with differential outputs</li> <li>4. A polarization splitting element, separating the input signal into two orthogonal polarizations, with each polarization delivered to a hybrid mixer</li> <li>5. A polarization maintaining power splitter or polarization splitting element, splitting the local oscillator power equally to the two hybrid mixers.</li> <li>6. An optical power tap, and monitor photodiode in the signal input path before the signal polarization splitting element.</li> </ol>

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Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
		<p>7. A variable optical attenuator in the signal input path before the signal polarization splitting element.</p> <p>Additional required functionality for the integrated coherent receiver includes:</p> <ul style="list-style-type: none"><li>• Automatic Gain Control (AGC) and/or Manual Gain Control (MGC)</li><li>• User settable output voltage swing</li><li>• Independent output swing adjustment for each of the four outputs</li><li>• Peak indicators for each output</li></ul> <p>(Figure 2-1 is presented below, showing the relationship of the functionalities in addition to the presence of ADC and DSP). OIF-DPC-MRX-01.0-IA at 10-11.</p>

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Asserted Claim No.	Claim Element	Exemplary Evidence of Infringement
		 <p><b>Figure 2-1: Functional diagram of a dual polarization micro intradyne coherent receiver.</b></p> <p>Notes:</p> <ol style="list-style-type: none"> <li>1. One configuration for the order of the VOA and MPD is shown. The configuration with the MPD followed by the VOA is an equally acceptable configuration.</li> <li>2. The yellow area enclosed by the dashed line indicates the functionality specified in this implementation agreement.</li> </ol> <div style="background-color: black; height: 120px; width: 438px;"></div>

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Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
		<div>[REDACTED]</div> <div>[REDACTED]</div> <div>[REDACTED]</div>

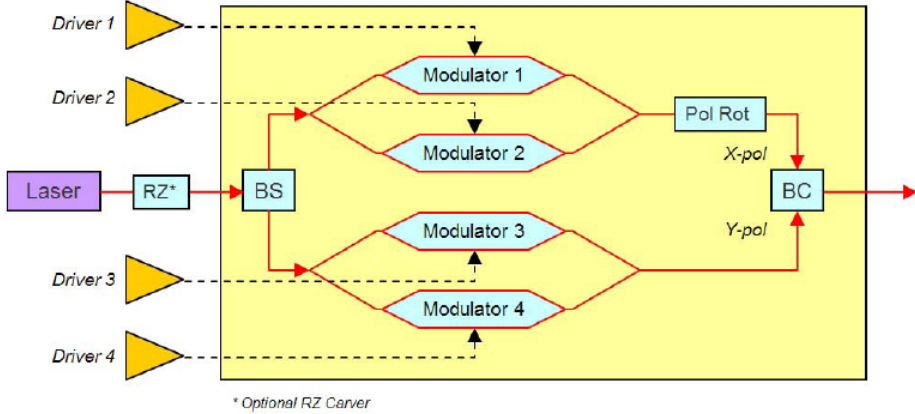
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Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
		<div style="background-color: black; width: 100%; height: 100%;"></div>
3	The transceiver card as recited in claim 1 wherein the modulator is a phase modulator.	<p>The Accused Instrumentalities include a modulator that is a phase modulator. QPSK requires phase modulation. For example: the Fujitsu 1100G OIF 168pin Coherent Transceiver (FIM85200) is a transceiver card with a transmitting and receiving interface for DP-QPSK data. (100G OIF 168pin Coherent Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gtrx/index.html">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gtrx/index.html</a>);</p>

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Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
		<p>the Fujitsu 100G CFP DCO Transceiver (FIM38000/100; FIM38100/100) is a transceiver card with a transmitting and receiving interface for DP-QPSK data. (100G CFP DCO Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp-dco/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp-dco/</a>);</p> <p>the Fujitsu 100G/200G CFP2 ACO Transceiver (FIM38500; FIM38100) is a transceiver card with a transmitting and receiving interface for DP-QPSK data. (100G/200G CFP2 ACO Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp2-aco/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp2-aco/</a>);</p> <p>the Fujitsu 100G CFP Transceiver (FIM37101; FIM37102; FIM37201; FIM37102) is a transceiver card with a transmitting and receiving interface for DP-QPSK data (100G CFP Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp/</a>);</p> <p>the Fujitsu 100G CFP2 Transceiver (FIM37301; FIM37302; FIM37401; FIM37402) is a transceiver card with a transmitting and receiving interface for DP-QPSK data (100G CFP2 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp2/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp2/</a>);</p> <p>the Fujitsu 100G QSFP28 Transceiver (FIM37700; FIM37800) is a transceiver card with a transmitting and receiving interface for DP-QPSK data (100G QSFP28 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100g-qsfp28/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100g-qsfp28/</a>);</p> <p>the Fujitsu 100G/400G LN Modulator (FTM7992HM; FTM7990HKA; FTM7977HQA) is a transceiver card with a transmitting and receiving interface for DP-QPSK data (100G Optical Devices Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g">http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g</a>);</p> <p>the Fujitsu 100G/400G Integrated Coherent Receiver (FIM24901; FIM24721) is a component of a transceiver with receiving interface for DP-QPSK data (100G QSFP28 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g">http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g</a>);</p> <p>the Fujitsu HD62 OTN Switch Aggregator Unit is a transceiver card with a transmitting and receiving interface for DP-QPSK data (Flashwave CDS Data Sheet);</p> <p>the Fujitsu TM61 OTU4 OTN Transponder Demarcation Unit is a transceiver card with a transmitting and receiving interface for DP-QPSK data (Flashwave CDS Data Sheet); and</p>

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Asserted Claim No.	Claim Element	Exemplary Evidence of Infringement
		<p>the Fujitsu Flashwave 7420 WDM Platform a transceiver card with a transmitting and receiving interface for DP-QPSK data (Flashwave 7420 Data Sheet)</p> <p>By way of example and without any limitation, the OIF 100G standard stated a DP QPSK transmitter module which includes a laser, modulators that modulate phase of the light, drivers, including other components that are not represented, as depicted below. See, e.g., OIF-FD-100G-DWDM-01.0 at 5-6.</p>  <p>* Optional RZ Carver</p> <p>Figure 4. Block diagram of a DP QPSK transmitter module</p> <div style="background-color: black; height: 80px; width: 100%;"></div>

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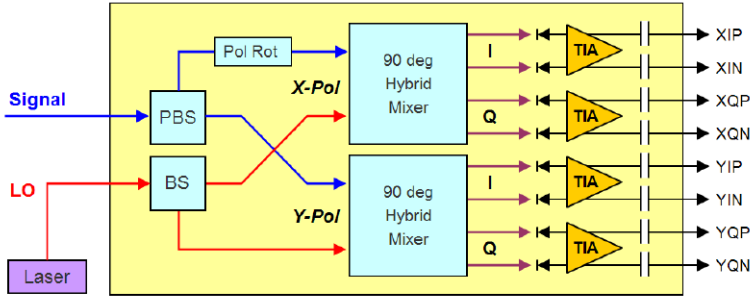
Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
		<div style="background-color: black; height: 70px; width: 100%;"></div> <div style="background-color: black; height: 125px; width: 100%;"></div> <div style="background-color: black; height: 120px; width: 100%;"></div>
4	The transceiver card as recited in claim 3 wherein the second optical signal comprises a phase modulated optical signal.	<p>The Accused Instrumentalities include a receiver that receives a phase-modulated optical signals. For example:</p> <p>the Fujitsu 1100G OIF 168pin Coherent Transceiver (FIM85200) is a transceiver card with a transmitting and receiving interface for DP-QPSK data. (100G OIF 168pin Coherent Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gtrx/index.html">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gtrx/index.html</a>);</p> <p>the Fujitsu 100G CFP DCO Transceiver (FIM38000/100; FIM38100/100) is a transceiver card with a transmitting and receiving interface for DP-QPSK data. (100G CFP DCO Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp-dco/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp-dco/</a>);</p>

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Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
		<p>the Fujitsu 100G/200G CFP2 ACO Transceiver (FIM38500; FIM38100) is a transceiver card with a transmitting and receiving interface for DP-QPSK data. (100G/200G CFP2 ACO Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp2-aco/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp2-aco/</a>);</p> <p>the Fujitsu 100G CFP Transceiver (FIM37101; FIM37102; FIM37201; FIM37102) is a transceiver card with a transmitting and receiving interface for DP-QPSK data (100G CFP Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp/</a>);</p> <p>the Fujitsu 100G CFP2 Transceiver (FIM37301; FIM37302; FIM37401; FIM37402) is a transceiver card with a transmitting and receiving interface for DP-QPSK data (100G CFP2 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp2/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp2/</a>);</p> <p>the Fujitsu 100G QSFP28 Transceiver (FIM37700; FIM37800) is a transceiver card with a transmitting and receiving interface for DP-QPSK data (100G QSFP28 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100g-qsfp28/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100g-qsfp28/</a>);</p> <p>the Fujitsu 100G/400G LN Modulator (FTM7992HM; FTM7990HKA; FTM7977HQA) is a transceiver card with a transmitting and receiving interface for DP-QPSK data (100G Optical Devices Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g">http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g</a>);</p> <p>the Fujitsu 100G/400G Integrated Coherent Receiver (FIM24901; FIM24721) is a component of a transceiver with receiving interface for DP-QPSK data (100G QSFP28 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g">http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g</a>);</p> <p>the Fujitsu HD62 OTN Switch Aggregator Unit is a transceiver card with a transmitting and receiving interface for DP-QPSK data (Flashwave CDS Data Sheet);</p> <p>the Fujitsu TM61 OTU4 OTN Transponder Demarcation Unit is a transceiver card with a transmitting and receiving interface for DP-QPSK data (Flashwave CDS Data Sheet); and</p> <p>the Fujitsu Flashwave 7420 WDM Platform a transceiver card with a transmitting and receiving interface for DP-QPSK data (Flashwave 7420 Data Sheet)</p>

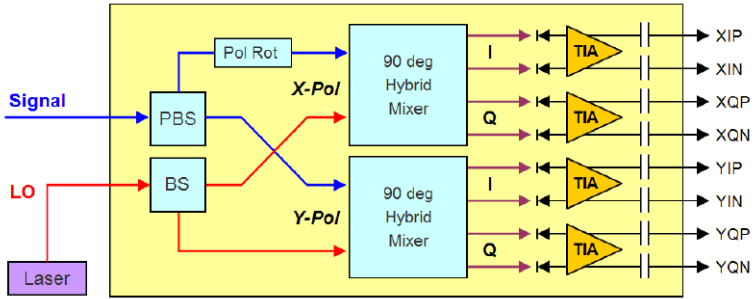
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Asserted Claim No.	Claim Element	Exemplary Evidence of Infringement
		<p>By way of example and without any limitation, the OIF 100G standard taught that the “signal [framed incoming data] then passes to the transceiver module. Data is converted to drive signals to control the optical modulators. A transmit laser provides the light source for the modulators. On the receive side the incoming signal is mixed with a local oscillator, demodulated into components, detected, amplified, digitized, then passed into the DSP module.” OIF-FD-100G-DWDM-01.0 at 9.</p> <p>By way of example and without any limitation, the OIF 100G standard taught a receiver module which receives a phase modulated signal through an optical fiber, as depicted below. See, e.g., OIF-FD-100G-DWDM-01.0 at 6.</p>  <p>Figure 5. Block diagram of a DP QPSK receiver module, shown with balanced detection and outputs.</p>

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Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
		<div style="background-color: black; height: 50px; width: 100%;"></div> <div style="background-color: black; height: 120px; width: 100%;"></div> <div style="background-color: black; height: 115px; width: 100%;"></div>
5	The transceiver card as recited in claim 1 wherein the energy level detector includes a photodiode and a linear or logarithmic amplifier scaling an output of the photodiode.	<p>On information and belief, the Accused Instrumentalities have an energy level detector that includes a photodiode and a linear or logarithmic amplifier scaling an output of the photodiode.</p> <p>By way of example and without any limitation, the OIF 100G standard stated that DP QPSK receiver module contains optical detectors and amplifiers, as depicted below. See, e.g., OIF-FD-100G-DWDM-01.0 at 6.</p>

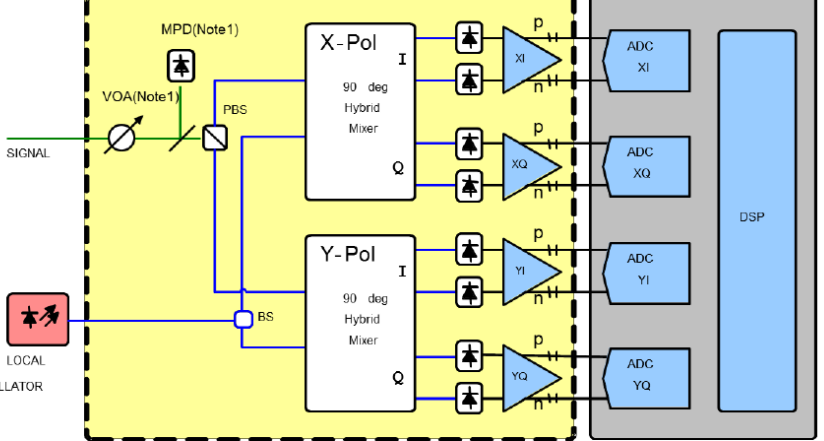
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Asserted Claim No.	Claim Element	Exemplary Evidence of Infringement
		 <p>Figure 5. Block diagram of a DP QPSK receiver module, shown with balanced detection and outputs.</p> <hr/> <p>By way of example and without any limitation, an OIF 100G standard taught that:</p> <p>As indicated in Figure 2-1, the coherent receiver requires the following basic functionality:</p> <ol style="list-style-type: none"> <li>1. Eight (8) photo-detectors, comprised of 4 sets of balanced detectors</li> <li>2. Four (4) linear amplifiers with differential ADC coupled outputs</li> <li>3. Two (2) ninety degree hybrid mixers with differential outputs</li> <li>4. A polarization splitting element, separating the input signal into two orthogonal polarizations, with each polarization delivered to a hybrid mixer</li> <li>5. A polarization maintaining power splitter or polarization splitting element, splitting the local oscillator power equally to the two hybrid mixers.</li> <li>6. An optical power tap, and monitor photodiode in the signal input path before the signal polarization splitting element.</li> </ol>

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Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
		<p>7. A variable optical attenuator in the signal input path before the signal polarization splitting element.</p> <p>Additional required functionality for the integrated coherent receiver includes:</p> <ul style="list-style-type: none"><li>• Automatic Gain Control (AGC) and/or Manual Gain Control (MGC)</li><li>• User settable output voltage swing</li><li>• Independent output swing adjustment for each of the four outputs</li><li>• Peak indicators for each output</li></ul> <p>(Figure 2-1 is presented below, showing the relationship of the functionalities in addition to the presence of ADC and DSP). OIF-DPC-MRX-01.0-IA at 10-11.</p>

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Asserted Claim No.	Claim Element	Exemplary Evidence of Infringement
		 <p><b>Figure 2-1: Functional diagram of a dual polarization micro intradyne coherent receiver.</b></p> <p>Notes:</p> <ol style="list-style-type: none"> <li>1. One configuration for the order of the VOA and MPD is shown. The configuration with the MPD followed by the VOA is an equally acceptable configuration.</li> <li>2. The yellow area enclosed by the dashed line indicates the functionality specified in this implementation agreement.</li> </ol> <p><u>On information and belief, the Flashwave 9500 Series and IFinity Products comprise the transceiver card as recited in claim 1 wherein the energy level detector includes a photodiode and a linear or logarithmic amplifier scaling an output of the photodiode.</u></p>
6	The transceiver card as recited in claim 1 wherein the thresholds are	<p>On information and belief, the Accused Instrumentalities include programmable thresholds for the energy level detector.</p> <p>By way of example and without any limitation, an OIF 100G standard taught that devices should</p>

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Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
	programmable.	<p>have “Alarm/Warning Threshold Registers,” including an “RX Power Monitor Alarm/Warning Threshold Select.” (OIF-CFP2-ACO-01.0, at 81)</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p>
7	The transceiver card as recited in claim 1 wherein the energy level detector includes a detector controller capable of setting values for the thresholds.	<p>On information and belief, the Accused Instrumentalities include a detector controller capable of setting values for the thresholds.</p> <p>By way of example and without any limitation, an OIF 100G standard taught that devices should have “Alarm/Warning Threshold Registers,” including an “RX Power Monitor Alarm/Warning Threshold Select.” (OIF-CFP2-ACO-01.0, at 81) On information and belief, a detector controller sets values for the thresholds.</p>

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Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
8	The transceiver card as recited in claim 7 wherein the detector controller receives an indication of a threshold being crossed.	<p>On information and belief, the Accused Instrumentalities include a detector controller that receives an indication of a threshold being crossed.</p> <p>By way of example and without any limitation, an OIF 100G standard taught that devices should have “Alarm/Warning Threshold Registers,” including registers for Rx power low and high warnings, and low and high alarms. (OIF-CFP2-ACO-01.0, at 81)</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p>
9	The transceiver card as recited in claim 1	On information and belief, the Accused Instrumentalities include threshold settings that bound an acceptable energy range for the received second optical signal.

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Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
	wherein the plurality of thresholds bound an acceptable energy range for the received second optical signal.	<p>By way of example and without any limitation, an OIF 100G standard taught that devices should have “Alarm/Warning Threshold Registers,” including an “RX Power Monitor Alarm/Warning Threshold Select.” (OIF-CFP2-ACO-01.0, at 81) The threshold settings bound an acceptable energy range for the received second optical signal in order to provide a meaningful indication of when the power is out of an acceptable range.</p> <div style="background-color: black; height: 200px; width: 100%;"></div> <div style="background-color: black; height: 70px; width: 100%;"></div> <div style="background-color: black; height: 86px; width: 100%;"></div>

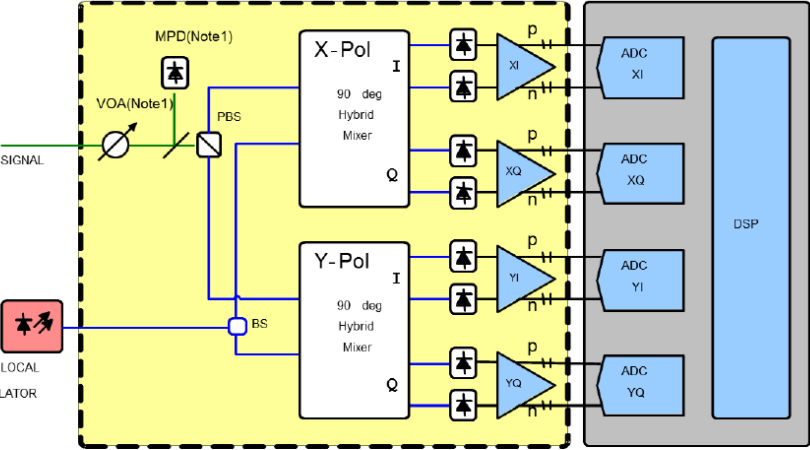
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Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
10	The transceiver card as recited in claim 1 wherein the plurality of thresholds indicate a drop in amplitude of a phase-modulated signal.	<p>On information and belief, the Accused Instrumentalities include thresholds indicate a drop in amplitude of a phase-modulated signal.</p> <p>By way of example and without any limitation, an OIF 100G standard taught that devices should have “Alarm/Warning Threshold Registers,” including including registers for an Rx power low warning and low alarm. (OIF-CFP2-ACO-01.0, at 81)</p> <p>[REDACTED]</p> <p>[REDACTED]</p> <p>[REDACTED]</p>

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Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
		
11	The transceiver card as recited in claim 1 wherein the plurality of thresholds indicate an increase in an optical energy level.	<p>On information and belief, the Accused Instrumentalities include thresholds indicate an increase in an optical energy level.</p> <p>By way of example and without any limitation, an OIF 100G standard taught that devices should have “Alarm/Warning Threshold Registers,” including including registers for an Rx power high warning and high alarm. (OIF-CFP2-ACO-01.0, at 81)</p> <p><u>By way of example and without any limitation, Fujitsu’s Flashwave 9500 Series product and IFinity products include the transceiver card as recited in claim 1 wherein the plurality of thresholds indicate an increase in an optical energy level. See, e.g., Exemplary Evidence of Infringement of Claim 10.</u></p>
12	The transceiver card as recited in claim 1 wherein the energy level detector measures optical power.	<p>The Accused Instrumentalities have an energy level detector that measures optical power.</p> <p>By way of example and without any limitation, an OIF 100G standard disclosed the use of a splitter to split the incoming optical signal to divert a portion of optical signal to the monitor photodiode as the optical signal is received by the receiver for demodulation. The monitor photodiode is used to measures optical power. See, e.g., OIF-DPC-MRX-01.0-IA at 10-11; see also the figure below.</p>

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Asserted Claim No.	Claim Element	Exemplary Evidence of Infringement
		 <p><b>Figure 2-1: Functional diagram of a dual polarization micro intradyne coherent receiver.</b></p> <p>Notes:</p> <ol style="list-style-type: none"> <li>1. One configuration for the order of the VOA and MPD is shown. The configuration with the MPD followed by the VOA is an equally acceptable configuration.</li> <li>2. The yellow area enclosed by the dashed line indicates the functionality specified in this implementation agreement.</li> </ol> <p>By way of example and without any limitation, Fujitsu's Flashwave 9500 Series product and IFinity products include the transceiver card as recited in claim 1 wherein the energy level detector measures optical power. See, e.g., Exemplary Evidence of Infringement of Claim 1[d], 1[e], and 9.</p>
14	[pre] A transceiver card for a telecommunications	Fujitsu infringed Claim 1, and the claims discussed herein that directly or indirectly depend on Claim 1, by making, selling, using, offering for sale, and/or causing to be used the Accused Instrumentalities.

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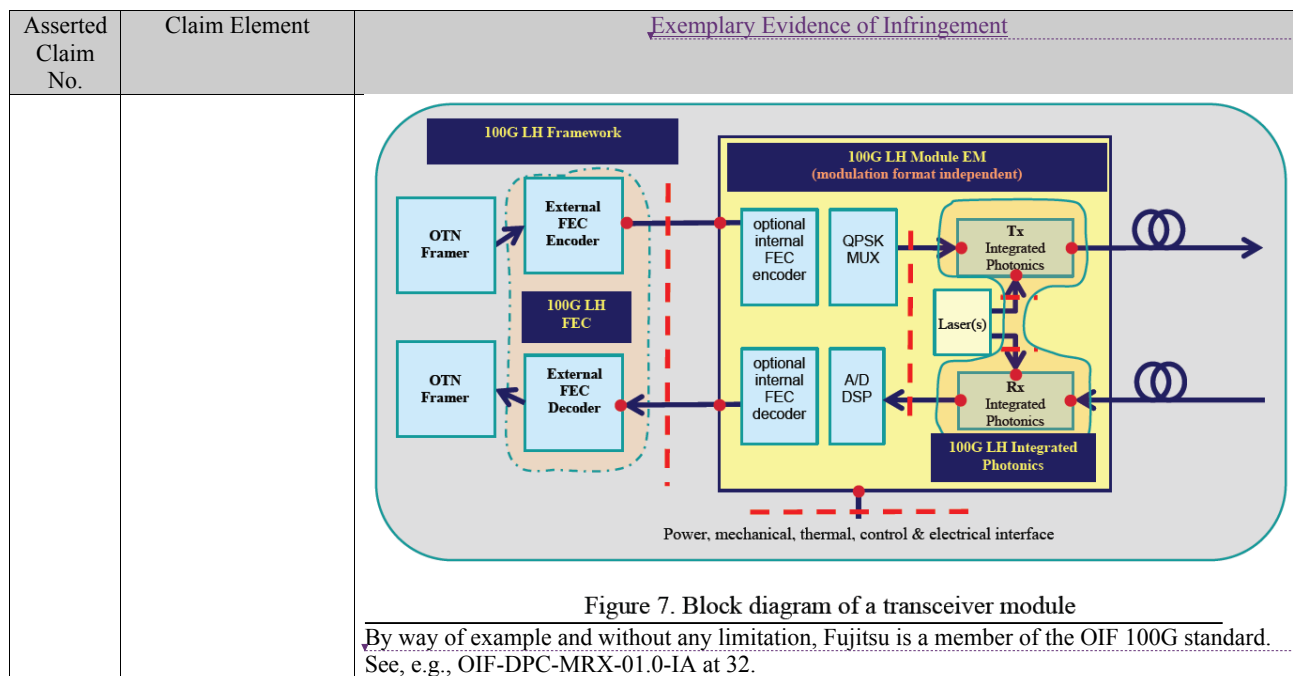
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Asserted Claim No.	Claim Element	Exemplary Evidence of Infringement
	box for transmitting data over a first optical fiber and receiving data over a second optical fiber, the transceiver card comprising:	<p>To the extent that the preamble is considered to be a limitation, the Accused Instrumentalities comprise transceiver card for a telecommunications box for transmitting data over a first optical fiber and receiving data over a second optical fiber.</p> <p>For example:</p> <p>the Fujitsu 1100G OIF 168pin Coherent Transceiver (FIM85200) is a transceiver card with a transmitting and receiving interface for DP-QPSK data. (100G OIF 168pin Coherent Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gtrx/index.html">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gtrx/index.html</a>);</p> <p>the Fujitsu 100G CFP DCO Transceiver (FIM38000/100; FIM38100/100) is a transceiver card with a transmitting and receiving interface for DP-QPSK data. (100G CFP DCO Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp-dco/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp-dco/</a>);</p> <p>the Fujitsu 100G/200G CFP2 ACO Transceiver (FIM38500; FIM38100) is a transceiver card with a transmitting and receiving interface for DP-QPSK data. (100G/200G CFP2 ACO Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp2-aco/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp2-aco/</a>);</p> <p>the Fujitsu 100G CFP Transceiver (FIM37101; FIM37102; FIM37201; FIM37102) is a transceiver card with a transmitting and receiving interface for DP-QPSK data (100G CFP Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp/</a>);</p> <p>the Fujitsu 100G CFP2 Transceiver (FIM37301; FIM37302; FIM37401; FIM37402) is a transceiver card with a transmitting and receiving interface for DP-QPSK data (100G CFP2 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp2/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp2/</a>);</p> <p>the Fujitsu 100G QSFP28 Transceiver (FIM37700; FIM37800) is a transceiver card with a transmitting and receiving interface for DP-QPSK data (100G QSFP28 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100g-qsfp28/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100g-qsfp28/</a>);</p> <p>the Fujitsu 100G/400G LN Modulator (FTM7992HM; FTM7990HKA; FTM7977HQA) is a transceiver card with a transmitting and receiving interface for DP-QPSK data (100G Optical</p>

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Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
		<p>Devices Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g">http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g</a>);  the Fujitsu 100G/400G Integrated Coherent Receiver (FIM24901; FIM24721) is a component of a transceiver with receiving interface for DP-QPSK data (100G QSFP28 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g">http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g</a>);  the Fujitsu HD62 OTN Switch Aggregator Unit is a transceiver card with a transmitting and receiving interface for DP-QPSK data (Flashwave CDS Data Sheet);  the Fujitsu TM61 OTU4 OTN Transponder Demarcation Unit is a transceiver card with a transmitting and receiving interface for DP-QPSK data (Flashwave CDS Data Sheet); and  the Fujitsu Flashwave 7420 WDM Platform a transceiver card with a transmitting and receiving interface for DP-QPSK data (Flashwave 7420 Data Sheet)</p> <p>By way of example and without any limitation, the OIF 100G standard taught a transceiver module, as depicted below. See, e.g., OIF-FD-100G-DWDM-01.0 at 8-9 (“All the blocks illustrated are contained on a single printed circuit board. The large block on the right represents the 100G transceiver module – electro mechanicals. As discussed above this OIF project addresses physical aspects of this module and the electrical data and control interfaces to it.”).</p>

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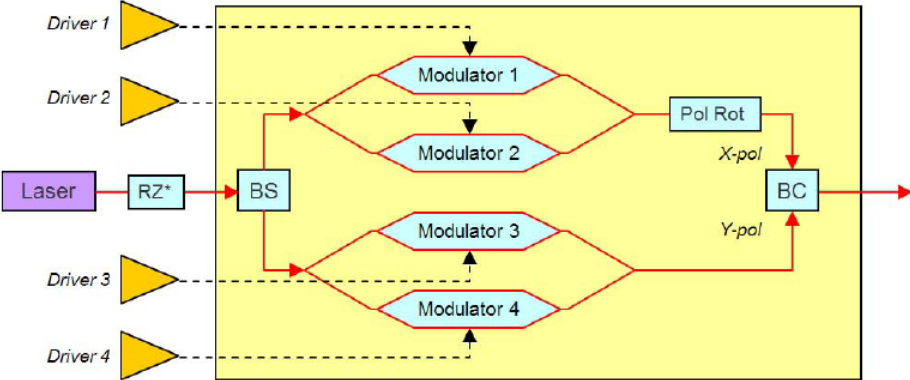
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Asserted Claim No.	Claim Element	Exemplary Evidence of Infringement																																																																																							
		<p><b>12 Appendix C: List of companies belonging to the OIF at approval date</b></p> <table> <tr><td>Acacia Communications</td><td>Fujikura</td><td>NeoPhotonics</td></tr> <tr><td>ADVA Optical Networking</td><td>Fujitsu</td><td>NTT Corporation</td></tr> <tr><td>Alcatel-Lucent</td><td>Furukawa Electric Japan</td><td>Oclaro</td></tr> <tr><td>Altera</td><td>Google</td><td>Orange</td></tr> <tr><td>AMCC</td><td>Hewlett Packard</td><td>PacketPhotonics</td></tr> <tr><td>Amphenol Corp.</td><td>Hitachi</td><td>PETRA</td></tr> <tr><td>Analog Devices</td><td>Huawei Technologies</td><td>Picomatrix</td></tr> <tr><td>Anritsu</td><td>IBM Corporation</td><td>PMC Sierra</td></tr> <tr><td>Applied Communication Sciences</td><td>Infinera</td><td>QLogic Corporation</td></tr> <tr><td>Avago Technologies Inc.</td><td>Inphi</td><td>Qorvo</td></tr> <tr><td>Broadcom</td><td>Intel</td><td>Ranovus</td></tr> <tr><td>Brocade</td><td>Ixia</td><td>Rockley Photonics</td></tr> <tr><td>BRPhotonics</td><td>JDSU</td><td>Samtec Inc.</td></tr> <tr><td>BTI Systems</td><td>Juniper Networks</td><td>Semtech</td></tr> <tr><td>China Telecom</td><td>Kaiaam</td><td>Spirent Communications</td></tr> <tr><td>Ciena Corporation</td><td>Kandou</td><td>Sumitomo Electric Industries</td></tr> <tr><td>Cisco Systems</td><td>KDDI R&amp;D Laboratories</td><td>Sumitomo Osaka Cement</td></tr> <tr><td>ClariPhy Communications</td><td>Keysight Technologies, Inc.</td><td>TE Connectivity</td></tr> <tr><td>Coriant R&amp;G GmbH</td><td>LeCroy</td><td>Tektronix</td></tr> <tr><td>CPqD</td><td>Luxtera</td><td>TELUS Communications, Inc.</td></tr> <tr><td>Deutsche Telekom</td><td>M/A-COM Technology Solutions</td><td>TeraXion</td></tr> <tr><td>Dove Networking Solutions</td><td>Mellanox Technologies</td><td>Texas Instruments</td></tr> <tr><td>EMC Corp</td><td>Microsemi Inc.</td><td>Time Warner Cable</td></tr> <tr><td>Emcore</td><td>Microsoft Corporation</td><td>US Conec</td></tr> <tr><td>Ericsson</td><td>Mitsubishi Electric Corporation</td><td>Verizon</td></tr> <tr><td>ETRI</td><td>Molex</td><td>Xilinx</td></tr> <tr><td>FCI USA LLC</td><td>MoSys, Inc.</td><td>Yamaichi Electronics Ltd.</td></tr> <tr><td>Fiberhome Technologies Group</td><td>MultiPhy Ltd</td><td>ZTE Corporation</td></tr> <tr><td>Finisar Corporation</td><td>NEC</td><td></td></tr> </table>	Acacia Communications	Fujikura	NeoPhotonics	ADVA Optical Networking	Fujitsu	NTT Corporation	Alcatel-Lucent	Furukawa Electric Japan	Oclaro	Altera	Google	Orange	AMCC	Hewlett Packard	PacketPhotonics	Amphenol Corp.	Hitachi	PETRA	Analog Devices	Huawei Technologies	Picomatrix	Anritsu	IBM Corporation	PMC Sierra	Applied Communication Sciences	Infinera	QLogic Corporation	Avago Technologies Inc.	Inphi	Qorvo	Broadcom	Intel	Ranovus	Brocade	Ixia	Rockley Photonics	BRPhotonics	JDSU	Samtec Inc.	BTI Systems	Juniper Networks	Semtech	China Telecom	Kaiaam	Spirent Communications	Ciena Corporation	Kandou	Sumitomo Electric Industries	Cisco Systems	KDDI R&D Laboratories	Sumitomo Osaka Cement	ClariPhy Communications	Keysight Technologies, Inc.	TE Connectivity	Coriant R&G GmbH	LeCroy	Tektronix	CPqD	Luxtera	TELUS Communications, Inc.	Deutsche Telekom	M/A-COM Technology Solutions	TeraXion	Dove Networking Solutions	Mellanox Technologies	Texas Instruments	EMC Corp	Microsemi Inc.	Time Warner Cable	Emcore	Microsoft Corporation	US Conec	Ericsson	Mitsubishi Electric Corporation	Verizon	ETRI	Molex	Xilinx	FCI USA LLC	MoSys, Inc.	Yamaichi Electronics Ltd.	Fiberhome Technologies Group	MultiPhy Ltd	ZTE Corporation	Finisar Corporation	NEC	
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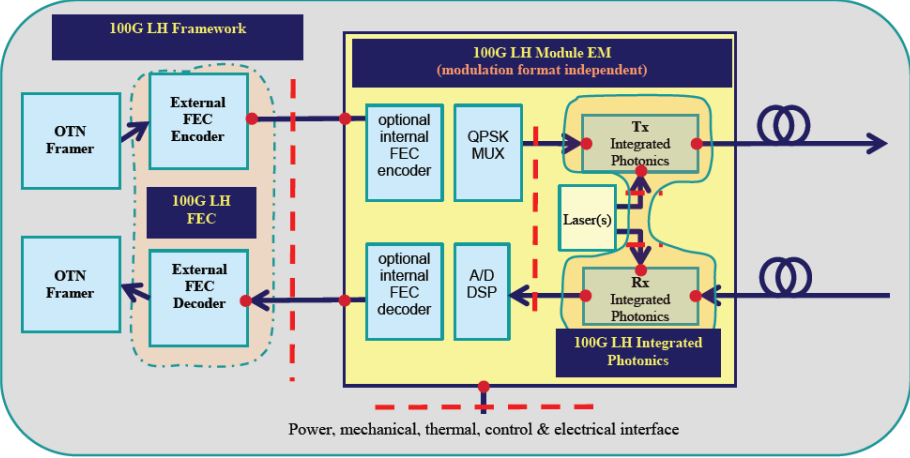


Asserted Claim No.	Claim Element	Exemplary Evidence of Infringement
		<p>By way of example and without any limitation, Fujitsu's Flashwave 9500 Series products and IFinity products comprise transceiver card for a telecommunications box for transmitting data over a first optical fiber and receiving data over a second optical fiber. See, e.g., Exemplary Evidence of Infringement of Claim 1.</p>
	<p>[a] a transmitter having a laser, a modulator, and a controller configured to receive input data and control the modulator to generate a first optical signal as a function of the input data;</p>	<p>The Accused Instrumentalities include a transmitter having a laser, a modulator, and a controller configured to receive input data and control the modulator to generate a first optical signal as a function of the input data.</p> <p>By way of example and without any limitation, the OIF 100G standard taught a transmitter module which includes a laser, modulators that modulate phase of the light, drivers, including other components that are not represented, as depicted below. See, e.g., OIF-FD-100G-DWDM-01.0 at 5-6.</p>  <p>* Optional RZ Carver</p> <p>Figure 4. Block diagram of a DP QPSK transmitter module</p>

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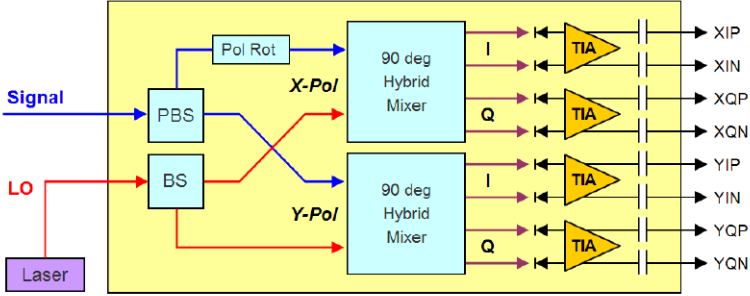
Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
		<p>By way of example and without any limitation, the OIF 100G standard taught that the “signal [framed incoming data] then passes to the transceiver module. Data is converted to drive signals to control the optical modulators. A transmit laser provides the light source for the modulators. On the receive side the incoming signal is mixed with a local oscillator, demodulated into components, detected, amplified, digitized, then passed into the DSP module.” OIF-FD-100G-DWDM-01.0 at 9.</p> <p><u>By way of example and without any limitation, Fujitsu’s Flashwave 9500 Series products and IFinity products comprise a transmitter having a laser, a modulator, and a controller configured to receive input data and control the modulator to generate a first optical signal as a function of the input data. See, e.g., Exemplary Evidence of Infringement of Claim 1[a].</u></p>
	[b] a fiber output optically connected to the transmitter and configured to optically connect the first optical fiber to the transceiver card;	<p>The Accused Instrumentalities include a a fiber output optically connected to the transmitter and configured to optically connect the first optical fiber to the transceiver card. By way of example and without any limitation, the Accused Instrumentalities include an optical fiber interface (100G OIF 168pin Coherent Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gtrx/index.html">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gtrx/index.html</a>); 100G/200G CFP2 ACO Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp2-aco/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp2-aco/</a>; 100G CFP Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp/</a>; 100G CFP2 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp2/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp2/</a>; 100G QSFP28 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100g-qsfp28/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100g-qsfp28/</a>; 100G Optical Devices Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g">http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g</a>; 100G QSFP28 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g">http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g</a>; Flashwave CDS Data Sheet; Flashwave 7420 Data Sheet)</p>

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Asserted Claim No.	Claim Element	Exemplary Evidence of Infringement
		<p>By way of example and without any limitation, the OIF 100G standard taught a transceiver module in which the optical signal is transmitted by Tx through a fiber output, as depicted below. See, e.g., OIF-FD-100G-DWDM-01.0 at 9.</p>  <p style="text-align: center;">Power, mechanical, thermal, control &amp; electrical interface</p> <p style="text-align: center;"><b>Figure 7. Block diagram of a transceiver module</b></p> <p>By way of example and without any limitation, Fujitsu's Flashwave 9500 Series products and IFinity products include a fiber output optically connected to the transmitter and configured to optically connect the first optical fiber to the transceiver card. See, e.g., Exemplary Evidence of Infringement of Claim 1[b].</p>
[c] a receiver configured to receive a second optical	a receiver configured to receive a second optical	The Accused Instrumentalities include a receiver configured to receive a second optical signal from the second optical fiber and to convert the second optical signal to output data.

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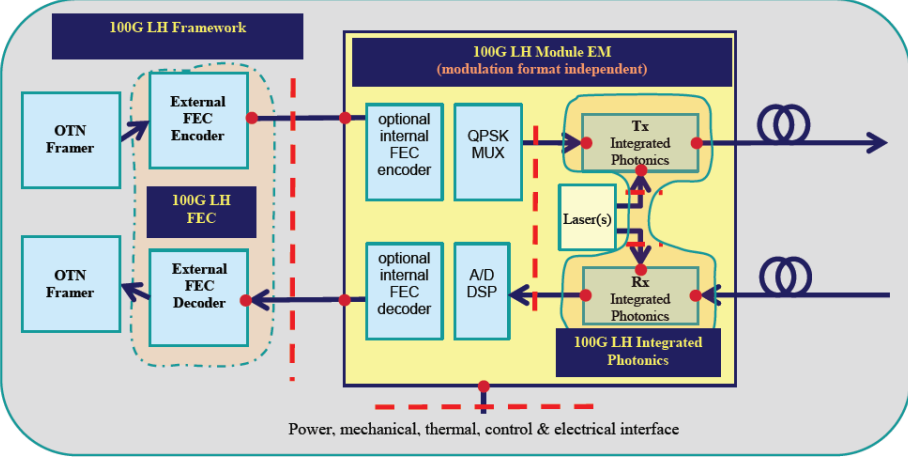
Asserted Claim No.	Claim Element	Exemplary Evidence of Infringement
	signal from the second optical fiber and to convert the second optical signal to output data;	<p>By way of example and without any limitation, the OIF 100G standard taught a receiver module which receives a phase modulated signal through an optical fiber, as depicted below. See, e.g., OIF-FD-100G-DWDM-01.0 at 6.</p>  <p>Figure 5. Block diagram of a DP QPSK receiver module, shown with balanced detection and outputs.</p> <p><u>By way of example and without any limitation, Fujitsu's Flashwave 9500 Series products and IFinity products include a receiver configured to receive a second optical signal from the second optical fiber and to convert the second optical signal to output data. See, e.g., Exemplary Evidence of Infringement of Claim 1[c].</u></p>
	[d] a fiber input optically connected to the receiver and configured to optically connect the second optical fiber to the transceiver card;	<p>The Accused Instrumentalities include a fiber input optically connected to the receiver and configured to optically connect the second optical fiber to the transceiver card. (100G OIF 168pin Coherent Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gtrx/index.html">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gtrx/index.html</a>); 100G/200G CFP2 ACO Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp2-aco/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp2-aco/</a>; 100G CFP Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp/</a>;</p>

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Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
		<p>100G CFP2 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp2/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp2/</a>; 100G QSFP28 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100g-qsfp28/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100g-qsfp28/</a>; 100G Optical Devices Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g">http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g</a>; 100G QSFP28 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g">http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g</a>; Flashwave CDS Data Sheet; Flashwave 7420 Data Sheet)</p> <p>By way of example and without any limitation, the OIF 100G standard taught a transceiver module in which the optical signal is received by Rx through a fiber input, as depicted below. See, e.g., OIF-FD-100G-DWDM-01.0 at 9.</p>

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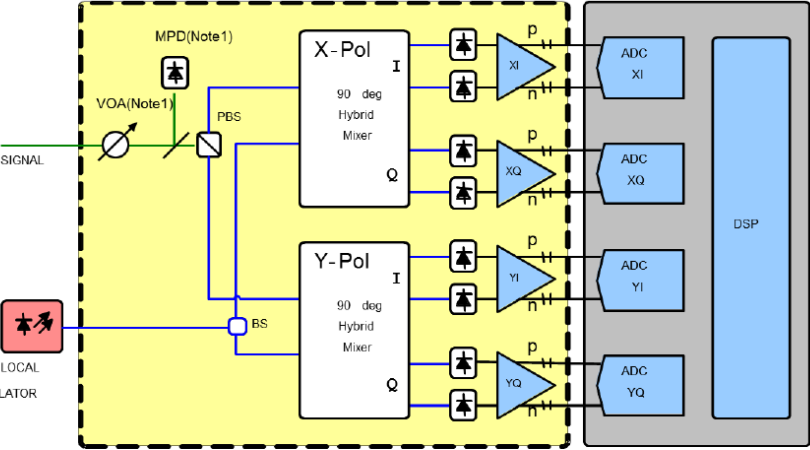
Asserted Claim No.	Claim Element	Exemplary Evidence of Infringement
		 <p>Figure 7. Block diagram of a transceiver module</p> <p>By way of example and without any limitation, Fujitsu's Flashwave 9500 Series products and IFinity products include a fiber input optically connected to the receiver and configured to optically connect the second optical fiber to the transceiver card. <i>See, e.g., Exemplary Evidence of Infringement of Claim 1[d]</i>.</p>
	[e] an energy level detector configured to measure an energy level of the second optical signal, the energy level detector including a threshold	<p>The Accused Instrumentalities include an energy level detector optically connected between the receiver and the fiber input to measure an energy level of the second optical signal, wherein the energy level detector includes a plurality of thresholds.</p> <p>By way of example and without any limitation, the OIF 100G standard taught that: [a]s indicated in Figure 2-1, the coherent receiver requires the following basic functionality:</p>

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Asserted Claim No.	Claim Element	Exemplary Evidence of Infringement
	indicating a drop in amplitude of the second optical signal.	<ol style="list-style-type: none"> <li>1. Eight (8) photo-detectors, comprised of 4 sets of balanced detectors</li> <li>2. Four (4) linear amplifiers with differential ADC coupled outputs</li> <li>3. Two (2) ninety degree hybrid mixers with differential outputs</li> <li>4. A polarization splitting element, separating the input signal into two orthogonal polarizations, with each polarization delivered to a hybrid mixer</li> <li>5. A polarization maintaining power splitter or polarization splitting element, splitting the local oscillator power equally to the two hybrid mixers.</li> <li>6. An optical power tap, and monitor photodiode in the signal input path before the signal polarization splitting element.</li> <li>7. A variable optical attenuator in the signal input path before the signal polarization splitting element.</li> </ol> <p>Additional required functionality for the integrated coherent receiver includes:</p> <ul style="list-style-type: none"> <li>• Automatic Gain Control (AGC) and/or Manual Gain Control (MGC)</li> <li>• User settable output voltage swing</li> <li>• Independent output swing adjustment for each of the four outputs</li> <li>• Peak indicators for each output</li> </ul> <p>(Figure 2-1 is presented below, showing the relationship of the functionalities in addition to the presence of ADC and DSP). OIF-DPC-MRX-01.0-IA at 10-11.</p>

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Asserted Claim No.	Claim Element	Exemplary Evidence of Infringement
		 <p><b>Figure 2-1: Functional diagram of a dual polarization micro intradyne coherent receiver.</b></p> <p>Notes:</p> <ol style="list-style-type: none"> <li>1. One configuration for the order of the VOA and MPD is shown. The configuration with the MPD followed by the VOA is an equally acceptable configuration.</li> <li>2. The yellow area enclosed by the dashed line indicates the functionality specified in this implementation agreement.</li> </ol> <p>By way of example and without any limitation, Fujitsu's Flashwave 9500 Series products and IFinity products include an energy level detector configured to measure an energy level of the second optical signal, the energy level detector including a threshold indicating a drop in amplitude of the second optical signal. See, e.g., Exemplary Evidence of Infringement of Claim 1[e], 10.</p>
15	The transceiver card of claim 14 wherein	The Accused Instrumentalities have an energy level detector that is optically connected between the receiver and the fiber input.

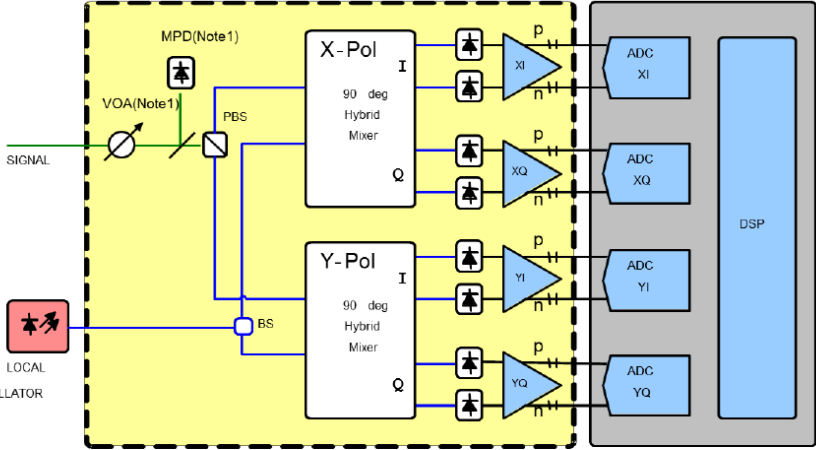
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Asserted Claim No.	Claim Element	Exemplary Evidence of Infringement
	the energy level detector is optically connected between the receiver and the fiber input.	<p>By way of example and without any limitation, an OIF 100G standard taught that:</p> <p>As indicated in Figure 2-1, the coherent receiver requires the following basic functionality:</p> <ol style="list-style-type: none"> <li>1. Eight (8) photo-detectors, comprised of 4 sets of balanced detectors</li> <li>2. Four (4) linear amplifiers with differential ADC coupled outputs</li> <li>3. Two (2) ninety degree hybrid mixers with differential outputs</li> <li>4. A polarization splitting element, separating the input signal into two orthogonal polarizations, with each polarization delivered to a hybrid mixer</li> <li>5. A polarization maintaining power splitter or polarization splitting element, splitting the local oscillator power equally to the two hybrid mixers.</li> <li>6. An optical power tap, and monitor photodiode in the signal input path before the signal polarization splitting element.</li> <li>7. A variable optical attenuator in the signal input path before the signal polarization splitting element.</li> </ol> <p>Additional required functionality for the integrated coherent receiver includes:</p> <ul style="list-style-type: none"> <li>• Automatic Gain Control (AGC) and/or Manual Gain Control (MGC)</li> <li>• User settable output voltage swing</li> <li>• Independent output swing adjustment for each of the four outputs</li> <li>• Peak indicators for each output</li> </ul> <p>(Figure 2-1 is presented below, showing the relationship of the functionalities in addition to the presence of ADC and DSP). OIF-DPC-MRX-01.0-IA at 10-11.</p>

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Asserted Claim No.	Claim Element	Exemplary Evidence of Infringement
		 <p><b>Figure 2-1: Functional diagram of a dual polarization micro intradyne coherent receiver.</b></p> <p>Notes:</p> <ol style="list-style-type: none"> <li>1. One configuration for the order of the VOA and MPD is shown. The configuration with the MPD followed by the VOA is an equally acceptable configuration.</li> <li>2. The yellow area enclosed by the dashed line indicates the functionality specified in this implementation agreement.</li> </ol> <p>By way of example and without any limitation, Fujitsu's Flashwave 9500 Series products and IFinity products include the transceiver card of claim 14 wherein the energy level detector is optically connected between the receiver and the fiber input. See, e.g., Exemplary Evidence of Infringement of Claim 1[e].</p>
17	The transceiver card as recited in claim 14 wherein the	The Accused Instrumentalities include a modulator that is a phase modulator. QPSK requires phase modulation. For example:

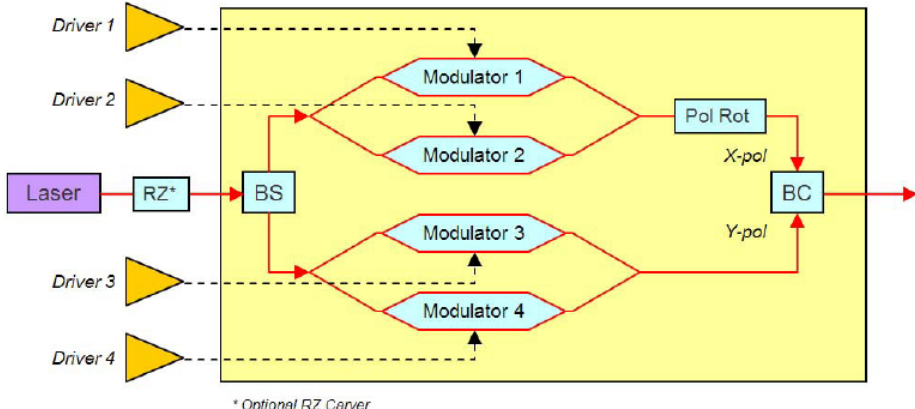
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Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
	modulator is a phase modulator.	<p>the Fujitsu 1100G OIF 168pin Coherent Transceiver (FIM85200) is a transceiver card with a transmitting and receiving interface for DP-QPSK data. (100G OIF 168pin Coherent Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gtrx/index.html">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gtrx/index.html</a>);</p> <p>the Fujitsu 100G CFP DCO Transceiver (FIM38000/100; FIM38100/100) is a transceiver card with a transmitting and receiving interface for DP-QPSK data. (100G CFP DCO Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp-dco/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp-dco/</a>);</p> <p>the Fujitsu 100G/200G CFP2 ACO Transceiver (FIM38500; FIM38100) is a transceiver card with a transmitting and receiving interface for DP-QPSK data. (100G/200G CFP2 ACO Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp2-aco/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp2-aco/</a>);</p> <p>the Fujitsu 100G CFP Transceiver (FIM37101; FIM37102; FIM37201; FIM37102) is a transceiver card with a transmitting and receiving interface for DP-QPSK data (100G CFP Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp/</a>);</p> <p>the Fujitsu 100G CFP2 Transceiver (FIM37301; FIM37302; FIM37401; FIM37402) is a transceiver card with a transmitting and receiving interface for DP-QPSK data (100G CFP2 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp2/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp2/</a>);</p> <p>the Fujitsu 100G QSFP28 Transceiver (FIM37700; FIM37800) is a transceiver card with a transmitting and receiving interface for DP-QPSK data (100G QSFP28 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100g-qsfp28/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100g-qsfp28/</a>);</p> <p>the Fujitsu 100G/400G LN Modulator (FTM7992HM; FTM7990HKA; FTM7977HQA) is a transceiver card with a transmitting and receiving interface for DP-QPSK data (100G Optical Devices Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g">http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g</a>);</p> <p>the Fujitsu 100G/400G Integrated Coherent Receiver (FIM24901; FIM24721) is a component of a transceiver with receiving interface for DP-QPSK data (100G QSFP28 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g">http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g</a>);</p>

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Asserted Claim No.	Claim Element	Exemplary Evidence of Infringement
		<p>the Fujitsu HD62 OTN Switch Aggregator Unit is a transceiver card with a transmitting and receiving interface for DP-QPSK data (Flashwave CDS Data Sheet);</p> <p>the Fujitsu TM61 OTU4 OTN Transponder Demarcation Unit is a transceiver card with a transmitting and receiving interface for DP-QPSK data (Flashwave CDS Data Sheet); and</p> <p>the Fujitsu Flashwave 7420 WDM Platform a transceiver card with a transmitting and receiving interface for DP-QPSK data (Flashwave 7420 Data Sheet)</p> <p>By way of example and without any limitation, the OIF 100G standard stated a DP QPSK transmitter module which includes a laser, modulators that modulate phase of the light, drivers, including other components that are not represented, as depicted below. See, e.g., OIF-FD-100G-DWDM-01.0 at 5-6.</p>  <p style="text-align: center;">* Optional RZ Carver</p> <p style="text-align: center;">Figure 4. Block diagram of a DP QPSK transmitter module</p> <p>By way of example and without any limitation, Fujitsu's Flashwave 9500 Series products and</p>

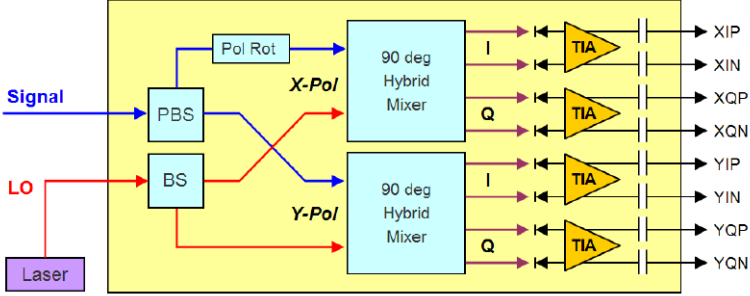
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Asserted Claim No.	Claim Element	Exemplary Evidence of Infringement
		<u>1</u> Finity products include the transceiver card as recited in claim 14 wherein the modulator is a phase modulator. <i>See, e.g., Exemplary Evidence of Infringement of Claim 3.</i>
18	The transceiver card as recited in claim 14 wherein the second optical signal comprises a phase-modulated optical signal.	<p>The Accused Instrumentalities include a receiver that receives a phase-modulated optical signals. For example:</p> <p>the Fujitsu 1100G OIF 168pin Coherent Transceiver (FIM85200) is a transceiver card with a transmitting and receiving interface for DP-QPSK data. (100G OIF 168pin Coherent Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gtrx/index.html">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gtrx/index.html</a>);</p> <p>the Fujitsu 100G CFP DCO Transceiver (FIM38000/100; FIM38100/100) is a transceiver card with a transmitting and receiving interface for DP-QPSK data. (100G CFP DCO Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp-dco/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp-dco/</a>);</p> <p>the Fujitsu 100G/200G CFP2 ACO Transceiver (FIM38500; FIM38100) is a transceiver card with a transmitting and receiving interface for DP-QPSK data. (100G/200G CFP2 ACO Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp2-aco/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/cfp2-aco/</a>);</p> <p>the Fujitsu 100G CFP Transceiver (FIM37101; FIM37102; FIM37201; FIM37102) is a transceiver card with a transmitting and receiving interface for DP-QPSK data (100G CFP Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp/</a>);</p> <p>the Fujitsu 100G CFP2 Transceiver (FIM37301; FIM37302; FIM37401; FIM37402) is a transceiver card with a transmitting and receiving interface for DP-QPSK data (100G CFP2 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp2/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100gcfp2/</a>);</p> <p>the Fujitsu 100G QSFP28 Transceiver (FIM37700; FIM37800) is a transceiver card with a transmitting and receiving interface for DP-QPSK data (100G QSFP28 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100g-qsfp28/">http://www.fujitsu.com/jp/group/foc/en/products/optical-modules/100g-qsfp28/</a>);</p> <p>the Fujitsu 100G/400G LN Modulator (FTM7992HM; FTM7990HKA; FTM7977HQA) is a transceiver card with a transmitting and receiving interface for DP-QPSK data (100G Optical Devices Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g">http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g</a>);</p>

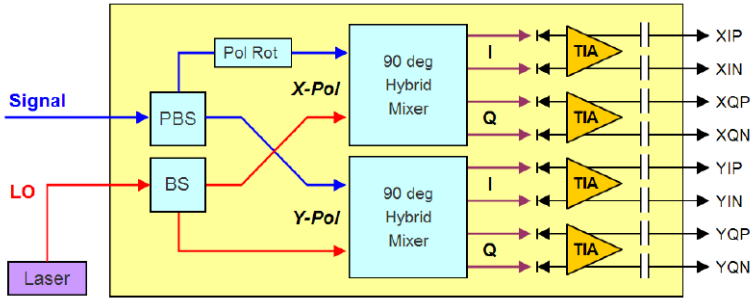
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Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
		<p>the Fujitsu 100G/400G Integrated Coherent Receiver (FIM24901; FIM24721) is a component of a transceiver with receiving interface for DP-QPSK data (100G QSFP28 Transceiver Product Page, <a href="http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g">http://www.fujitsu.com/jp/group/foc/en/products/optical-devices/#ln-100g</a>); the Fujitsu HD62 OTN Switch Aggregator Unit is a transceiver card with a transmitting and receiving interface for DP-QPSK data (Flashwave CDS Data Sheet); the Fujitsu TM61 OTU4 OTN Transponder Demarcation Unit is a transceiver card with a transmitting and receiving interface for DP-QPSK data (Flashwave CDS Data Sheet); and the Fujitsu Flashwave 7420 WDM Platform a transceiver card with a transmitting and receiving interface for DP-QPSK data (Flashwave 7420 Data Sheet)</p> <p>By way of example and without any limitation, the OIF 100G standard taught that the “signal [framed incoming data] then passes to the transceiver module. Data is converted to drive signals to control the optical modulators. A transmit laser provides the light source for the modulators. On the receive side the incoming signal is mixed with a local oscillator, demodulated into components, detected, amplified, digitized, then passed into the DSP module.” OIF-FD-100G-DWDM-01.0 at 9.</p> <p>By way of example and without any limitation, the OIF 100G standard taught a receiver module which receives a phase modulated signal through an optical fiber, as depicted below. See, e.g., OIF-FD-100G-DWDM-01.0 at 6.</p>

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Asserted Claim No.	Claim Element	Exemplary Evidence of Infringement
		 <p>Figure 5. Block diagram of a DP QPSK receiver module, shown with balanced detection and outputs.</p> <p>By way of example and without any limitation, Fujitsu's Flashwave 9500 Series products and 1Finity products include the transceiver card as recited in claim 14 wherein the second optical signal comprises a phase-modulated optical signal. See, e.g., Exemplary Evidence of Infringement of Claim 4.</p>
19	The transceiver card as recited in claim 14 wherein the energy level detector includes a photodiode and a linear or logarithmic amplifier scaling an output of the photodiode.	<p>On information and belief, the Accused Instrumentalities have an energy level detector that includes a photodiode and a linear or logarithmic amplifier scaling an output of the photodiode.</p> <p>By way of example and without any limitation, the OIF 100G standard stated that DP QPSK receiver module contains optical detectors and amplifiers, as depicted below. See, e.g., OIF-FD-100G-DWDM-01.0 at 6.</p>

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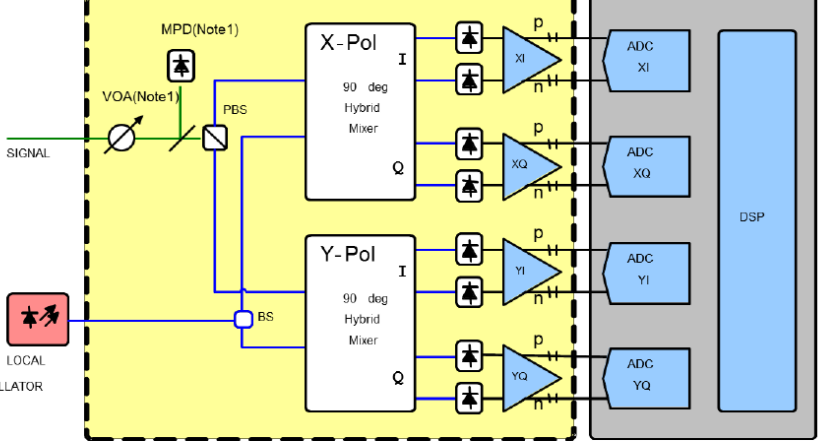
Asserted Claim No.	Claim Element	Exemplary Evidence of Infringement
		 <p>Figure 5. Block diagram of a DP QPSK receiver module, shown with balanced detection and outputs.</p> <hr/> <p>By way of example and without any limitation, an OIF 100G standard taught that:</p> <p>As indicated in Figure 2-1, the coherent receiver requires the following basic functionality:</p> <ol style="list-style-type: none"> <li>1. Eight (8) photo-detectors, comprised of 4 sets of balanced detectors</li> <li>2. Four (4) linear amplifiers with differential ADC coupled outputs</li> <li>3. Two (2) ninety degree hybrid mixers with differential outputs</li> <li>4. A polarization splitting element, separating the input signal into two orthogonal polarizations, with each polarization delivered to a hybrid mixer</li> <li>5. A polarization maintaining power splitter or polarization splitting element, splitting the local oscillator power equally to the two hybrid mixers.</li> <li>6. An optical power tap, and monitor photodiode in the signal input path before the signal polarization splitting element.</li> </ol>

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Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
		<p>7. A variable optical attenuator in the signal input path before the signal polarization splitting element.</p> <p>Additional required functionality for the integrated coherent receiver includes:</p> <ul style="list-style-type: none"><li>• Automatic Gain Control (AGC) and/or Manual Gain Control (MGC)</li><li>• User settable output voltage swing</li><li>• Independent output swing adjustment for each of the four outputs</li><li>• Peak indicators for each output</li></ul> <p>(Figure 2-1 is presented below, showing the relationship of the functionalities in addition to the presence of ADC and DSP). OIF-DPC-MRX-01.0-IA at 10-11.</p>

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Asserted Claim No.	Claim Element	Exemplary Evidence of Infringement
		 <p><b>Figure 2-1: Functional diagram of a dual polarization micro intradyne coherent receiver.</b></p> <p>Notes:</p> <ol style="list-style-type: none"> <li>1. One configuration for the order of the VOA and MPD is shown. The configuration with the MPD followed by the VOA is an equally acceptable configuration.</li> <li>2. The yellow area enclosed by the dashed line indicates the functionality specified in this implementation agreement.</li> </ol> <p><u>By way of example and without any limitation, Fujitsu's Flashwave 9500 Series products and IFinity products include the transceiver card as recited in claim 14 wherein the energy level detector includes a photodiode and a linear or logarithmic amplifier scaling an output of the photodiode. See, e.g., Exemplary Evidence of Infringement of Claim 5.</u></p>
20	The transceiver card as recited in claim 14 wherein the threshold	On information and belief, the Accused Instrumentalities include programmable thresholds for the energy level detector.

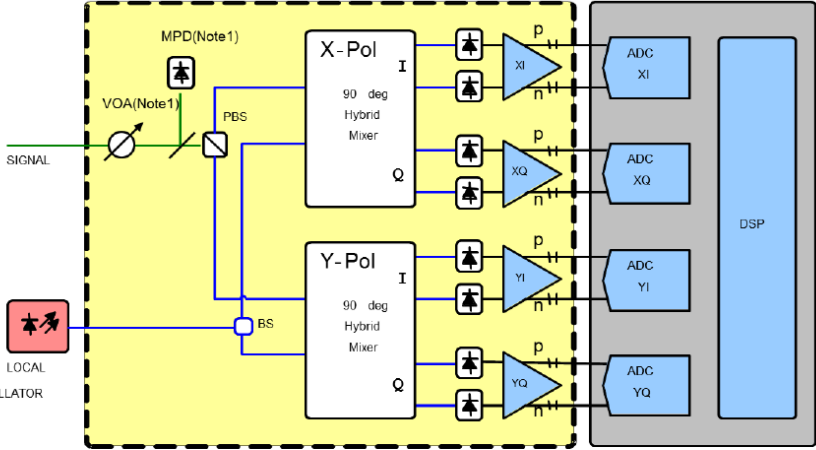
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Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
	is programmable.	<p>By way of example and without any limitation, an OIF 100G standard taught that devices should have “Alarm/Warning Threshold Registers,” including an “RX Power Monitor Alarm/Warning Threshold Select.” (OIF-CFP2-ACO-01.0, at 81)</p> <p><u>By way of example and without any limitation, Fujitsu’s Flashwave 9500 Series products and IFinity products include the transceiver card as recited in claim 14 wherein the threshold is programmable. See, e.g., Exemplary Evidence of Infringement of Claim 6.</u></p>
21	The transceiver card as recited in claim 14 wherein the energy level detector includes a detector controller capable of setting a value for the threshold.	<p>On information and belief, the Accused Instrumentalities include a detector controller capable of setting values for the thresholds.</p> <p>By way of example and without any limitation, an OIF 100G standard taught that devices should have “Alarm/Warning Threshold Registers,” including an “RX Power Monitor Alarm/Warning Threshold Select.” (OIF-CFP2-ACO-01.0, at 81) On information and belief, a detector controller sets values for the thresholds.</p> <p><u>By way of example and without any limitation, Fujitsu’s Flashwave 9500 Series products and IFinity products include the transceiver card as recited in claim 14 wherein the energy level detector includes a detector controller capable of setting a value for the threshold. See, e.g., Exemplary Evidence of Infringement of Claim 7.</u></p>
22	The transceiver card as recited in claim 21 wherein the detector controller receives an indication of the threshold being crossed.	<p>On information and belief, the Accused Instrumentalities include a detector controller that receives an indication of a threshold being crossed.</p> <p>By way of example and without any limitation, an OIF 100G standard taught that devices should have “Alarm/Warning Threshold Registers,” including registers for Rx power low and high warnings, and low and high alarms. (OIF-CFP2-ACO-01.0, at 81)</p> <p><u>By way of example and without any limitation, Fujitsu’s Flashwave 9500 Series products and IFinity products include the transceiver card as recited in claim 14 wherein the detector controller receives an indication of the threshold being crossed. See, e.g., Exemplary Evidence of Infringement of Claim 8.</u></p>

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Asserted Claim No.	Claim Element	<u>Exemplary Evidence of Infringement</u>
23	The transceiver card as recited in claim 14 wherein the plurality of thresholds bound an acceptable energy range for the received second optical signal.	<p>On information and belief, the Accused Instrumentalities include threshold settings that bound an acceptable energy range for the received second optical signal.</p> <p>By way of example and without any limitation, an OIF 100G standard taught that devices should have “Alarm/Warning Threshold Registers,” including an “RX Power Monitor Alarm/Warning Threshold Select.” (OIF-CFP2-ACO-01.0, at 81) The threshold settings bound an acceptable energy range for the received second optical signal in order to provide a meaningful indication of when the power is out of an acceptable range.</p> <p><u>By way of example and without any limitation, Fujitsu’s Flashwave 9500 Series products and Infini products include the transceiver card as recited in claim 14 wherein the plurality of thresholds bound an acceptable energy range for the received second optical signal. See, e.g., Exemplary Evidence of Infringement of Claim 9.</u></p>
24	The transceiver card as recited in claim 14 wherein the energy level detector measures optical power.	<p>The Accused Instrumentalities have an energy level detector that measures optical power.</p> <p>By way of example and without any limitation, an OIF 100G standard disclosed the use of a splitter to split the incoming optical signal to divert a portion of optical signal to the monitor photodiode as the optical signal is received by the receiver for demodulation. The monitor photodiode is used to measures optical power. See, e.g., OIF-DPC-MRX-01.0-IA at 10-11; see also the figure below.</p>

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Asserted Claim No.	Claim Element	Exemplary Evidence of Infringement
		 <p><b>Figure 2-1: Functional diagram of a dual polarization micro intradyne coherent receiver.</b></p> <p>Notes:</p> <ol style="list-style-type: none"> <li>1. One configuration for the order of the VOA and MPD is shown. The configuration with the MPD followed by the VOA is an equally acceptable configuration.</li> <li>2. The yellow area enclosed by the dashed line indicates the functionality specified in this implementation agreement.</li> </ol> <p>By way of example and without any limitation, Fujitsu's Flashwave 9500 Series products and IFinity products include the transceiver card as recited in claim 14 wherein the energy level detector measures optical power. See, e.g., Exemplary Evidence of Infringement of Claim 12.</p>

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